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END SEMESTER EXAMINATION, DECEMBER - 2024**B.Sc. (Hons.) in DS Semester - III****Course Name: Introduction to Data Science using Python Course code: BDS234**

Time allotted: 03 Hours

Max. Marks: 100

Note: Read all the instructions carefully.

Q.1. Attempt all.**(10×2=20)**

QN	Questions	CO	PO
a.	What do you mean by command line argument?	CO2	PO1
b.	Name the type of Boolean operators.	CO2	PO1
c.	What do you mean by graphical model.	CO5	PO1
d.	Define Python tuple.	CO2	PO1
e.	What is the difference between break and continue statement?	CO3	PO2
f.	Define inferential Statistics?	CO1	PO1
g.	Define Indentation in python.	CO2	PO1
h.	Define Visualization.	CO1	PO1
i.	What do you mean by operator precedence?	CO2	PO1
j.	What is a variable?	CO2	PO1

Q.2. Attempt any five out of Seven.**(5×4=20)**

QN	Questions	CO	PO
a.	Write a program to perform addition, subtraction, multiplication and division on two integers.	CO2	PO2
b.	Implement the python program to calculate total and average marks based on input?	CO3	PO2
c.	What is Probability? Explain the role of probability in Data Science.	CO1	PO1
d.	Differentiate for loop and while loop with example.	CO3	PO2
e.	Define Variable and mention rules for choosing names of Variable.	CO2	PO2
f.	Explain the difference between recursive and iterative technique.	CO2	PO3
g.	Explain the role of prediction in data science model.	CO5	PO1

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Q.3. Attempt any three out of four.

(3×10=30)

QN	Questions	CO	PO
a.	Explain the following terms in dictionary– (3+3+4) (i) all() (ii)any() (iii)Immutable built-in data type		
		CO2	PO1
		CO2	PO1
		CO2	PO1
b.	Attempt all. (3+3+4) (i) What is Interpreter? (ii) Explain How python interpreter works. (iii) What are the differences between python and C language?		
		CO1	PO1
		CO1	PO2
		CO1	PO2
c.	Attempt all. (3+3+4) (i) Explain different types of comments in python. (ii)Explain Method Overloading in Python. (iii) Explain input() in Python.		
		CO1	PO1
		CO4	PO1
		CO2	PO1
d.	Attempt all. (3+3+4) (i) What do you mean by mutable data type? (ii)Write a python program that shows the concept of Inheritance. (iii)What are the properties of algorithm?		
		CO2	PO1
		CO4	PO1 ,2
		CO1	PO1

Q.4. Attempt any two out of three.

(2×15=30)

QN	Questions	CO	PO
a.	(i) What is an Exception? Explain types of exceptions and give an example.	CO4	PO1
	(ii)What do you mean by constructor? Explain with an example.		,2
b.	(i) What is outlier Analysis? Use any method to detect outlier exist in the data 13,15,15,16, 19,20,20,21,22,22,25,25,25,25,30,33, 35, 35, 35, 35, 36, 40, 45, 46, 52, 70. Also draw the boxplot. (ii) (ii) How knowledge is important in taking decision making? Make use of KDD process to show the process of knowledge mining.	CO4	PO1
		CO1	PO1
		CO1	PO1
c.	(i)Write a python script for Factorial of a number using recursion. (ii) Explain the difference between Regression and Classification in detail.	CO2	PO2
			.3
		CO5	PO2

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END SEMESTER EXAMINATION, DECEMBER - 2024**B.Sc. (Hons.) in DS Semester – III****Course Name: Database Management Systems****Course code: BDS233****Time allotted: 03 Hours****Max. Marks: 100****Note: Read all the instructions carefully.****Q.1. Attempt all.****(10×2=20)**

a.	Define the terms data and information.	CO1	PO1
b.	What is data Abstraction?	CO1	PO2
c.	What are key constraint?	CO2	PO3
d.	Define relation.	CO2	PO1
e.	Define First Normal Form.	CO4	PO4
f.	Discuss the use of order by in sql.	CO3	PO2
g.	Define functional dependency.	CO4	PO1
h.	Define Deadlock.	CO5	PO6
i.	What is transaction?	CO5	PO7
j.	Define Null Values.	CO3	PO8

Q.2. Attempt any five out of Seven.**(5×4=20)**

a.	What is functional dependency? Explain its usage in database design.	CO4	PO1
b.	Explain in detail about views.	CO1	PO2
c.	What is data model? List the types of data models.	CO1	PO3
d.	Explain the terms degree and cardinality of relation.	CO2	PO1
e.	Discuss features of the ER-Models.	CO2	PO4
f.	Compare BCNF with 3NF.	CO4	PO2
g.	Discuss how you implement Atomicity and Durability.	CO5	PO1

Q.3. Attempt any three out of four.**(3×10=30)**

a.	What is a join? Define various types of joins. Explain natural join operation with example.	CO3	PO1
b.	Implement following relation using SQL query. Employee (emp no, emp name, department, city, salary) (i) Find all the employee whose emp no is less than 100 and salary more than 25000 and department is "Account" (ii) Count the no of employee and Sum the salary of all employee (iii) Delete the employee having minimum salary	CO3	PO2
c.	What is normalization? What is redundancy? Compare 1NF and 2NF with example.	CO4	PO3
d.	What is concurrency? What are the three problems due to concurrency? How the problems can be avoided, explain for one of the three problems.	CO5	PO1

Q.4. Attempt any two out of three.**(2×15=30)**

a.	What are anomalies in database design? How can we solve it? Explain 4NF	CO3	PO1
b.	Distinguish strong entity set with weak entity set? Draw an ER diagram to illustrate Weak entity set?	CO2	PO2
c.	What is database schema? Explain the concept of serializability & recoverability	CO5	PO3

END SEMESTER EXAMINATION, DECEMBER - 2024**B. Sc. (Hons.) in DS Semester - III****Course Name: Software Engineering****Course Code: BDS232****Time allotted: 03 Hours****Max. Marks: 100****Note: Read all the instructions carefully.****(10X2=20)****Q1. Objectives Type Questions (Attempt All)**

a.	Which requirement type describes what the system should do and how it should behave? A) Functional requirements B) Non-functional requirements C) Design requirements D) User requirements	CO4	2
b.	What is the primary focus of architectural design in software engineering? A) Defining user interface elements B) Determining the software development process C) Structuring the software system D) Identifying test cases	CO2	3
c.	What is the primary purpose of Software Configuration Management (SCM)? A) Tracking and controlling changes to software artifacts B) Ensuring that software is free of defects C) Designing the user interface D) Managing software development teams	CO3	2
d.	What does ISO stand for in the context of ISO 9000 certification? A) International Software Organization B) Internal Software Operations C) International Organization for Standardization D) International Software Optimization	CO4	2
e.	Which software component is responsible for managing system resources and providing services to applications? A) Application software B) Operating system C) Compiler D) Database management system	CO2	1
f.	What type of software testing focuses on evaluating the software's behavior in real-world scenarios? A) Unit Testing B) Integration Testing C) System Testing D) White-Box Testing	CO3	2
g.	Which software metric measures the complexity of a software module's control flow? A) LOC (Lines of Code) B) McCabe's Cyclomatic Complexity C) Code Coverage D) Failure Rate	CO4	2
h.	What is the main focus of Requirement Elicitation in software engineering? A) Designing the user interface B) Gathering and understanding user needs C) Implementing the software D) Testing the software	CO2	3
i.	Which project management activity involves allocating resources, estimating costs, and scheduling tasks? A) Feasibility Analysis B) Risk Assessment C) Project Planning D) Quality Assurance	CO3	2
j.	Which testing technique focuses on verifying the internal logic and code structure of the software? A) Black-Box Testing B) White-Box Unit Testing C) Integration Testing D) System Testing	CO4	2

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Q2. Short Answer Type (Attempt any five out of seven)

(5X4=20)

a.	What is the importance of software in modern systems?	CO1	
b.	Name some test techniques commonly used in software testing.	CO3	2
c.	What is User Interface Design, and why is it essential?	CO2	3
d.	What is the difference between software static and dynamic analysis?	CO5	2
e.	What is the software crisis in software engineering?	CO4	2
f.	Name some requirement elicitation techniques	CO3	2
g.	Differentiate between functional and non-functional requirements.	CO4	2

Q3. Structured Questions (Attempt any three out of four)

(3X10=30)

a.	(i) How has the role of software evolved over time? (ii) What are the major components of software systems? (iii) How do software applications impact various industries?	CO1	3,1,1
b.	(i) What is Integration Testing, and why is it important in software development? (ii) Define System Testing and describe its scope. (iii) Name some other Specialized Testing approaches in software quality assurance.	CO3	2,2,1
c.	(i) What is the purpose of Project Scheduling in software project management? (ii) How is Risk Assessment carried out in project management? (iii) What is the significance of Risk Mitigation in software projects?	CO2	3,3,1
d.	(i) Explain the Spiral Model in software development. (ii) Explain the Linear Sequential Model in software development. (iii) Name some Evolutionary Process Models and briefly explain one of them.	CO5	2,2,2

Q4. Long Answers (Attempt any two out of three)

(2X15=30)

a.	(i) How do advanced risk assessment and mitigation techniques reduce project risks in complex software endeavors? (ii) Discuss the stages involved in the Linear Sequential Model for software development.	CO4	2,2
b.	(i) What are the advanced techniques for handling software engineering problems that may arise during SDLC? (ii) Explain the complexities involved in implementing the Spiral Model in software development.	CO2	1,3
c.	(i) What are the advanced capabilities and limitations of CASE tools in modern software development? (ii) Discuss advanced documentation and project management techniques using CASE tools.	CO3	2,2

END SEMESTER EXAMINATION, DECEMBER - 2024**B.Sc. (Hons.) in DS Semester - III****Course Name: Linear Algebra****Course code: BDS231****Time allotted: 03 Hours****Max. Marks: 100****Note: Read all the instructions carefully.****Q.1. Objectives Type****(10 X 2=20)****(Very short/ Short Answer, MCQ, One-liners, Fill in the Blank, True/ False) Attempt all.**

S.N	Questions	CO	PO
a.	The set of all polynomials with real coefficients defined on the interval I is a vector space. (True/False)	2	2
b	A homogenous system of equations has unique solutions if	1	1
c	A square matrix A of order five has four linearly independent vectors then it is diagonalizable. (True/False)	4	3
d	Define an invertible linear transformation.	3	1
e	Determine whether the subset $S = \{(-1, 1, 3), (-1, 0, 4), (3, 0, -2), (0, -2, 2)\}$ of V_3 is linearly dependent or independent.	2	1
f	Find the eigenvalues of the matrix $A = \begin{bmatrix} 5 & 0 & 0 \\ 4 & -1 & 0 \\ 6 & 2 & 2 \end{bmatrix}$.	4	2
g	What is the dimension of the vector space M_{mn} of all real matrices of order $m \times n$.	2	3
h	Find the normalized vector for the vector $u = (2, 1, -3)$.	5	2
i	Let $T: U \rightarrow V$ be a linear transformation and $\dim(U) = 4$. If nullity of T is 2 then what is the rank of T .	3	4
j	State Cayley-Hamilton theorem.	4	1

Q.2. Short notes / Short Answer Type (Attempt any five out of Seven)**(5 X 4=20)**

a.	Determine whether the set $S = \{(1, 2, 1), (-1, 1, 0), (5, -1, 2)\}$ is linearly dependent or independent.	2	1
b	Find the rank of following matrix by applying elementary row operations (ERO) $A = \begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$	1	1
c	Determine a vector of unit length which is orthogonal to the vector $(-1, 6, 2)$ of V_3 with respect to standard inner product.	5	1
d	Let V be a vector space of all polynomials. Determine whether the subset W consisting of all polynomials of degree less than equal to n is a subspace of V .	2	2
e	Let U and V be three dimensional vector spaces and the linear transformation $T: U \rightarrow V$ defined as $T(x_1, x_2, x_3) = (x_1 + x_2 + x_3, x_3 + x_2, x_3)$ be one-one. If $B = \{(1, 0, 0), (0, 1, 0), (0, 0, 1)\}$ is the basis for U then find the basis for V .	3	3
f	Determine whether the subset $S = \{(1, 1, 1), (1, 2, 3), (-1, 0, 1)\}$ forms a basis for V_3 .	2	2

g	Let $T: V_2 \rightarrow V_3$ be defined by $T(x_1, x_2) = (x_1 - x_2, x_1 - 3x_2, -4x_2)$ and $B_1 = \{e_1, e_1\}$, $B_2 = \{f_1, f_2, f_3\}$ be standard bases for V_2 and V_3 respectively. Find the matrix of T relative to B_1 and B_2 .	3	3
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Q.3. Structured Question (Attempt any three out of four)

(3 X 10=30)

a.	For the following matrix A. $A = \begin{bmatrix} 1 & 2 & 2 \\ 0 & 2 & 1 \\ -1 & 2 & 2 \end{bmatrix}$ Determine, (i) Eigenvalues of A (ii) Eigenvectors of A (iii) Algebraic and geometric multiplicity of all the eigenvalues of A.	4	2
b	(i) Solve the following system of equations by applying elementary row operations (5) $\begin{aligned} x + 2y - z &= 1 \\ 3x - 2y + 2z &= 2 \\ 7x - 2y + 3z &= 5. \end{aligned}$ Let $S = \{(1, 2, 1), (1, 1, -1), (4, 5, -2)\}$. Determine whether the vector $(2, -1, -8)$ is in the span of S. (5)	1	1
c	Verify Cayley-Hamilton theorem for the following matrix. $A = \begin{bmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$	2	2
d	Let the linear transformation $T: V_3 \rightarrow V_3$ be defined as $T(x_1, x_2, x_3) = \left(\frac{1}{2}x_1 + x_2 + x_3, x_1 - \frac{1}{3}x_2, x_3\right)$. Verify the rank and nullity theorem for T.	4	1
		3	3

Q.4. Long Answer / Essay type (Attempt any two out of three)

(2 X 15=30)

a.	(i) Apply Gram-Schmidt process to the vectors $\{(1, 0, 1, 1), (-1, 0, -1, 1), (0, -1, 1, 1)\}$ of V_4 to obtain an orthonormal basis for V_4 . Find the coordinates of the vector $(-1, 3, 1)$ relative to ordered basis $B = \{(2, 1, 0), (2, 1, 1), (2, 2, 1)\}$ of V_3 . (9)	5	4
b	(i) Determine whether there exists a linear transformation $T: V_2 \rightarrow V_2$ for the following map. If it exists find the general formula for it. (8) $T(2, 1) = (2, 1) \text{ and } T(1, 2) = (4, 2).$ (ii) Investigate whether the linear transformation $T: V_3 \rightarrow V_3$ defined below is nonsingular. If it is nonsingular, find T^{-1} (7) $T(x_1, x_2, x_3) = (x_1 + x_2 + x_3, x_3 + x_2, x_3).$	2	4
c	Find the modal matrix P which diagonalizes the following matrix A and hence diagonalize the matrix A (10) $A = \begin{bmatrix} 0 & 3 \\ 2 & -1 \end{bmatrix}$ (ii) Determine whether the linear transformation $T: V_2 \rightarrow V_3$ defined as $T(x_1, x_2) = (x_1, x_1 + x_2, x_2)$ is onto. (5)	4	3
		5	3
